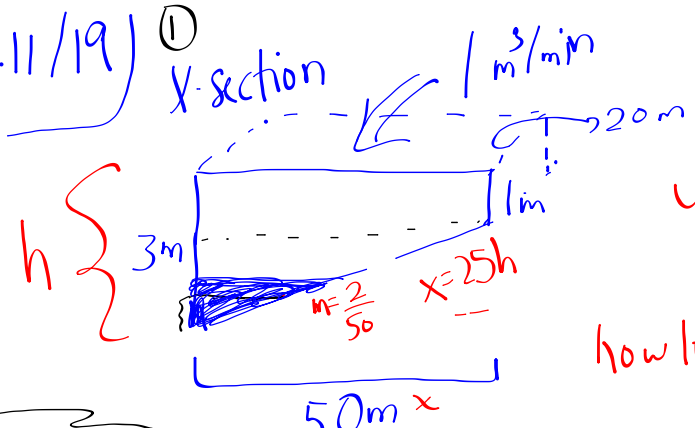
day 48

3.11/19 ① X-section



what is $\frac{dh}{dt}$ after 250 min?
how long will it take to fill the pool?

② $V = \left[\frac{1}{2}(b_1+b_2)h\right](20)$

$V = \left[\frac{1}{2}(25h)(h)\right](20) = 250h^2$ when $h \le 2$

$V = 1000 + (h-2)(50)(20)$ when $h > 2$

$= 1000 + 1000h - 2000 = 1000h - 1000$

③ $\frac{dV}{dt} = \begin{cases} 500h\frac{dh}{dt}, & h \le 2 \\ 1000\frac{dh}{dt}, & h > 2 \end{cases}$

After 250 min
$V = 250\ m^3$
$250\ m^3 = 250h^2\ m^3$
$h = 1$ m

④a at 250 min, $h = 1$ m,

$1 = \frac{dV}{dt} = 500(1)\left(\frac{dh}{dt}\right)$

$\frac{1}{500}\ m/min = \frac{dh}{dt}$

④b when is pool FULL?

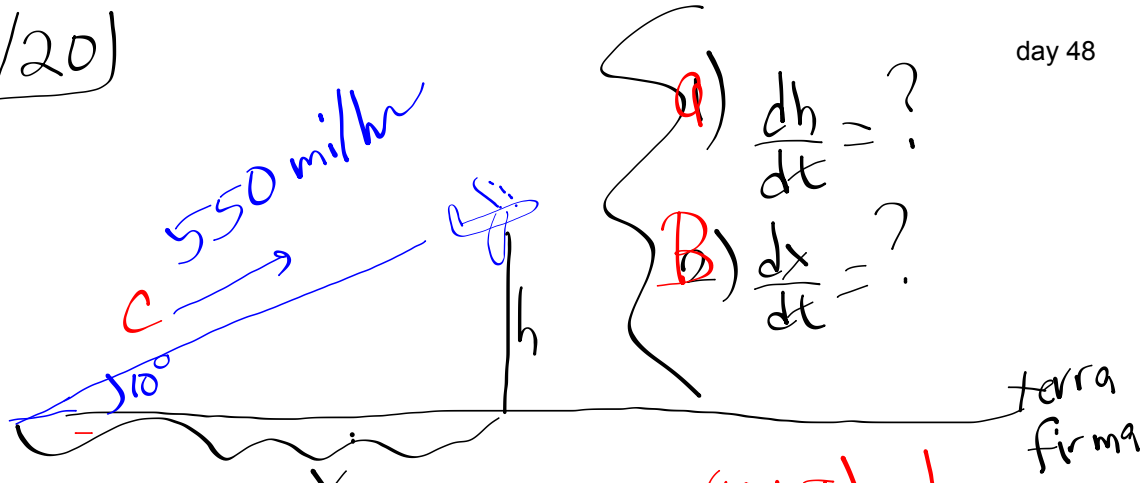
$= 1000h - 1000$ at $h = 3$

$V(3) = 1000(3) - 1000 = 2000\ m^3$

3.11/20

day 48

1



A) $\frac{dh}{dt} = ?$

B) $\frac{dx}{dt} = ?$

2a) $\sin(10^\circ) = \frac{h}{c}$ OR $\sin\left(\frac{10*\pi}{180}\right) = \frac{h}{c}$

$\star \sin\left(\frac{\pi}{18}\right) = \frac{h}{c}$ eqt EQUATION ALWAYS TRUE

$c \cdot \sin\frac{\pi}{18} = h$

3a) $\frac{dc}{dt}\left(\sin\frac{\pi}{18}\right) = \frac{dh}{dt}$

4a) $550\left(\sin\frac{\pi}{18}\right) = \frac{dh}{dt} \approx 295.5 \frac{mi}{hr}$

$\sin 10^\circ = \frac{dh/dt}{550}$ mi/hr

? ? ?

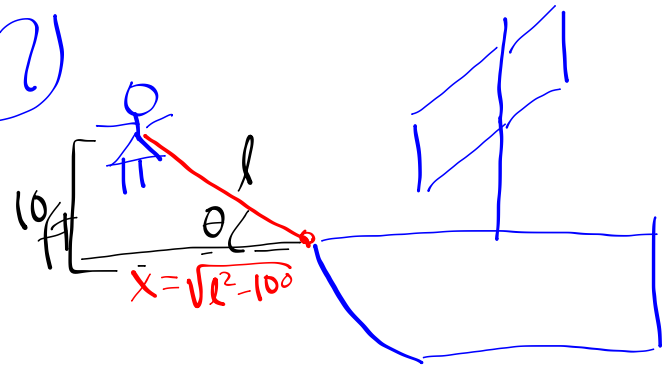
2b) $c\cos\left(\frac{\pi}{18}\right) = x$

3b) $\frac{dc}{dt}\left(\cos\left(\frac{\pi}{18}\right)\right) = \frac{dx}{dt}$

4b) $550\cos\frac{\pi}{18} = \frac{dx}{dt} \approx 541.6 \frac{mi}{hr}$

day 48

3.10/67)



a) show $\frac{d\theta}{d\ell} = \frac{-10}{\ell\sqrt{\ell^2-100}}$

a2) $\sin\theta = \frac{10}{\ell}$

a3) $\cos\theta \cdot \frac{d\theta}{d\ell} = \frac{-10}{\ell^2}\left(\frac{d\ell}{d\ell}\right)$

$\frac{d\theta}{d\ell} = \frac{-10}{(\cos\theta)\,\ell^2}$

a4)

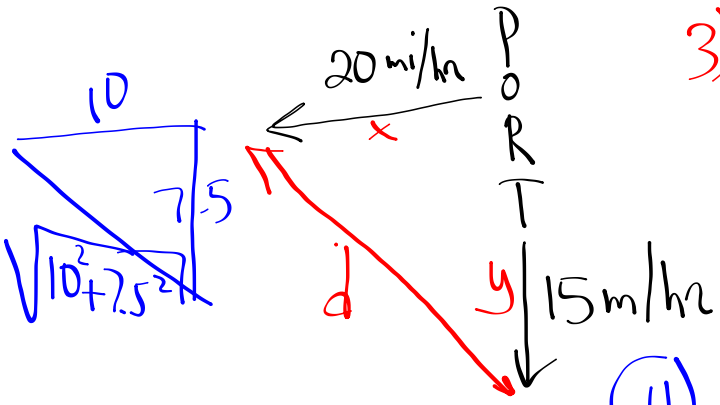
$\frac{d\theta}{d\ell} = \frac{-10}{\left(\frac{\sqrt{\ell^2-100}}{\ell}\right)\ell^2} = \frac{-10}{(\sqrt{\ell^2-100})\ell}$

b)

day 48

3.11/22

after 30 min



2) $d^2 = x^2 + y^2$

3) $2d\frac{dd}{dt} = 2x\frac{dx}{dt} + 2y\frac{dy}{dt}$

$d\frac{dd}{dt} = x\frac{dx}{dt} + y\frac{dy}{dt}$

(4) $\sqrt{10^2+7.5^2}\frac{dd}{dt} = 10(20) + 7.5(15)$

$\frac{dd}{dt} = \frac{512.5}{\sqrt{10^2+7.5^2}}$

day 48

3.9/80)

$f(x) = \log_2 \frac{8}{\sqrt{x+1}}$

$\frac{1}{\frac{8}{\sqrt{x+1}}}$

$f'(x) = \frac{1}{\ln 2}\left(\frac{\sqrt{x+1}}{8}\right) \cdot \frac{d}{dx}\left(\frac{8}{\sqrt{x+1}}\right)$

$= \frac{\sqrt{x+1}}{8 \ln 2}\left[\frac{-4}{(x+1)^{3/2}}\right]$

simp

$= -\frac{1}{(2\ln 2)(x+1)}$

$\frac{8}{\sqrt{x+1}} = 8(x+1)^{-\frac{1}{2}}$

$\frac{d}{dx}\left(8(x+1)^{-1/2}\right) =$

$-4(x+1)^{-3/2}\frac{d}{dx}(x+1)$

$= \frac{-4}{(x+1)^{3/2}}$

$f(x) = \log_2 \frac{8}{\sqrt{x+1}} = \log_2 8 - \log_2 \sqrt{x+1}$

$= 3 - \frac{1}{2}\log_2(x+1)$

$f'(x) = -\frac{1}{2}\left(\frac{1}{(\ln 2)(x+1)}\right)$